DIGITAL CONTENT CREATOR/REPRODUCER AND ADVERTISEMENT DISTRIBUTION SYSTEM

BACKGROUND OF THE INVENTION

The present invention relates to an advertisement

10 distribution system using networks. Particularly, the

present invention relates to a system for inserting

identification data (electronic watermark data) with

special information into a digital content and then

distributing a desired advertisement to browsers of the

15 digital content through a network.

Recently, contents have been digitized vigorously. It

will be true that an explosive increase of WWW users over

the Internet as well as the spread of the hardware that can

use large capacity data at personal level have quickly

20 accelerated the digitization of contents. With the

digitization of contents accelerated, illegal copies of

digital contents have caused a serious social problem. The

technique of inserting and detecting electronic watermarked

data is noted as a technique of blocking the illegal copies

25 and is being now studied toward practical use. The

electronic watermarking technique is a technique of burying

ID information, as a kind of noise, being difficult for men

to recognize but being machine readable, in the data itself

of a digital content. The buried information always is in

5   presence together with the digital content and cannot be
easily erased and changed. Using those features, the
electronic watermarking technique aims at preventing
digital contents from being illegally copied.

As described above, the original object of the electronic
10   watermarking technique is to prevent digital contents from
being illegally copied. In other words, the electronic
watermarked data is utilized for the copyright protection
and hence is restricted in usage. Broader diffusion of the
electronic watermarking technique has been intended by
15   expanding uses of the electronic watermarked data.

In contrast, the wide spread of the Internet has
stimulated the business in which an advertisement agency
gains earnings from advertisements placed on a home page.
For example, among some of the so-called portal sites,
20   there are advertisement sites that are being successfully
run with advertisement earnings. Hence, the maximum concern
of the advertisement agency having advertisement sites is
how the access count to their advertisement sites is
increased. The reason is that an increase in access count
25   to an advertisement site in open enhances the reputation
therefor so that an increased number of companies wanting
advertisements to be placed on the site leads to an
increase of earnings of the advertisement agency.

SUMMARY OF THE INVENTION

5   The present invention is made to solve the above-
mentioned problems. An objective of the present invention
to provide a technique of technically combining a business
that supplies digital contents including electronic
10   watermarked data with an advertisement business on the
Internet. Thus, this technique stimulates the spread of the
electronic watermarking technique, activates advertisement
businesses over the Internet and increases advertisement
incomes to the advertisement agency of an advertisement
15   site.

In order to achieve the above object, the URL of an
advertisement site is inserted into electronic watermarked
data. Thus, the mechanism that the user, who views the
digital content containing the electronic watermarked data,
20   accesses a predetermined advertisement site is provided.
For that reason, the present invention relates to the
digital content creator, a digital content reproducer, and
an advertisement information distribution system in which
them are combined with the Internet. The features of these
25   devices and the system are as follows:

The digital content creator of the present invention
features that electronic watermarked data, in which the URL
of a Web site supplying advertisement information is
described, is inserted into a digital content.

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5   Moreover, according to the present invention, the digital
content reproducer detects electronic watermarked data from
a digital content containing the electronic watermarked
data while manifests the digital content on the display.
The feature is that the Web site supplying advertisement
10   information is accessed based on the value of the
electronic watermarked data and the advertisement
information is manifested on the display.

Moreover, the advertisement information distribution
system includes a communication line as well as a digital
15   content reproducer, an advertisement site, and a digital
content creator, interconnected to the communication line.
The digital content creator has an inserter for inserting
electronic watermarked data into a digital content. The
digital content reproducer includes means for detecting
20   electronic watermarked data from a digital content
containing the electronic watermarked data, means for
reading advertisement information from an advertisement
site specified with the electronic watermarked data value,
and means for displaying the reproduced digital content and
25   the advertisement information. The advertisement site
includes means for distributing goods or services.

An example of the electronic watermark insertion and
detection technique will be explained below for reference.
However, the present invention should not be limited to the

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5   example only but can be realized using other electronic

watermark insertion and detection technique.

The method of frequency-converting an image and then

burying electronic watermarked data in an area with a

strong frequency component of a video signal after the

10   frequency conversion has been proposed as an example of an

electronic watermarking technique (refer to NIKKEI

Electronics. April 22, 1996, (no. 660), page. 13). In this

method, since the electronic watermarked data is buried in

the strong frequency component, a loss of the electronic

15   watermarked data does not occur even if it is subjected to

a compression/expansion process or imaging such as

filtering. The electronic watermarked data cannot be

removed if the original image is not destroyed. Moreover,

using random numbers obeying a normal distribution as

20   electronic watermarked data prevents interference between

sets of electronic watermarked data. As a result, the

method can prevent a decrease in image quality due to the

burying of electronic watermarked data.

In the electronic watermarked data burying method, an

25   original image is converted into frequency components using

the DCT (discrete cosine conversion). N sets of data having

high values over the frequency region are selected as $f(1)$,

$f(2)$, …, $f(n)$. Sets of electronic watermarked data $w(1)$,

$w(2)$, …, $w(n)$ are selected from a normal distribution which

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5   has the average value of 0 and the distribution value of 1.
The following formula is calculated in terms of i.

$$F(i)=f(i)+\alpha \times |f(i)| \times w(i)$$

10   where α is a scaling factor.

The image in which electronic watermarked data is buried
can be obtained by subjecting F(i) to inverse DCT
conversion.

The electronic watermarked data is detected in the

15   following way. In this detection method, the original image
f(i) and electronic watermarked data candidate w(i) (where
i = 1, 2, …, n) have to be known.

The electronic-watermarked-data inserted image is
converted into a frequency component using the DCT. Values

20   of factors f(1), f(2), …, f(n), into which electronic
watermarked data is buried over the frequency region,
correspond to F(1), F(2), …, F(n), respectively. The
electronic watermarked data W(i) is calculated and
extracted in accordance with the following formula.

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$$W(i)=(F(i)-f(i))/f(i)$$

Next, the statistical similarity of w(i) and W(i) is
calculated using the inner product of vectors and the

5   following formula.

    $$C = W \cdot w / (WD \times_w D)$$

    Where

10 $W = (W(1), W(2), \ldots, W(n))$,

    $w = (w(1), w(2), \ldots, w(n))$,

    WD = an absolute value of a vector W, wD = an absolute

    value of a vector w, and $\cdot$ is an inner product of a vector.

    When the statistical similarity C exceeds a specific

15 value, it is judged that the corresponding electronic

    watermarked data is in a buried state.

    The above method in which electronic watermarked data is

    buried in an image is effective when a copyright owner of

    the original image detects digital image data suspected of

20 being an illegal copy. In this method, since the original

    image is required, the copyright owner can detect the

    electronic watermarked data buried in the illegal image

    data. However, the reproducer at each terminal cannot

    detect the electronic watermarked data because of no

25 possession of the original image.

    For that reason, an improvement of the method has been

    proposed. In the improved method, the original image is

    divided into blocks each having 8 pixels $\times$ 8 pixels. The

    electronic watermarked data is buried and extracted in

5   processing units of each block.

In the electronic watermarked data burying process, it is
assumed that f(1), f(2), …, f(n) are arranged in the
frequency increasing order of AC components in a frequency
region after completion of DCT. The electronic watermarked

10 data w(1), w(2), …, w(n) are first selected from the normal
distribution with an average value of 0 and a dispersion
value of 1. Each i is calculated by the following formula.

$$F(i) = f(i) + \alpha \times avg(f(i)) \times w(i)$$

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where α is a scaling factor, and avg(f(i)) is a partial
average obtained by averaging absolute values of adjacent
three points.

The electronic watermarked data is detected in accordance

20 with the following method. In this detection method, the
original image is not required but the electronic
watermarked data candidate w(i) (where i = 1, 2, …, n) has
to be known.

An image in which electronic watermarked data is buried

25 can be obtained by subjecting F(i) to inverse DCT
conversion.

The electronic watermarked data is detected in the
following method.

An image in which electronic watermarked data is buried

5   is subjected to DCT conversion. F(1), F(2), …, F(n) are

arranged in the frequency-component increasing order over

the frequency region in each block. The average value of

the absolute values at adjacent three points, F(i-1), F(i),

F(i+1), of F(i) is assumed to be a partial average

10 avg(F(i)). The electronic watermarked data W(i) is

calculated with the formula, W(i) = F(i)/avg(F(i)). The sum

WF(i) of W(i) for one image is calculated for each (i).

Next, the statistical similarity of w(i) and WF(i) is

calculated using the vector inner product and the following

15 formula.

C=WF・w/(WFD ×wD)

When the statistical similarity C exceeds a specific value,

20 it is judged that the corresponding watermarked data is in

a buried state.

BRIEF DESCRIPTION OF THE DRAWINGS

This and other objects, features and advantages of the

25 present invention will become more apparent upon a reading

of the following detailed description and drawings, in

which,

Fig. 1 is a block diagram illustrating a digital content

creator according to an embodiment of the present

5   invention;

Fig. 2 is a flowchart illustrating of a digital content

creation method according to an embodiment of the present

invention;

Fig. 3 is a block diagram illustrating a recording medium

10   according to an embodiment of the present invention;

Fig. 4 is a block diagram illustrating the digital

content creator according to the embodiment of the present

invention;

Fig. 5 is a block diagram illustrating the digital

15   content creator according to the embodiment of the present

invention;

Fig. 6 is a block diagram illustrating a recording medium

according to an embodiment of the present invention; and

Fig. 7 is a block diagram illustrating an advertisement

20   information distribution system according to an embodiment

of the present invention.

DESCRIPTION OF THE EMBODIMENTS

A digital content creator according to an embodiment of

25   the present invention will be described below by referring

to the attached drawings.

Fig. 1 is a block diagram illustrating the configuration

of a digital content creator.

The digital content creator inserts electronic

5   watermarked data which includes the URL of a Web site

originating advertisement information, into a digital

content (still images, moving images, and audio). The

digital content is supplied through a disk recording medium

such as DVD, CD-ROM, and the like or through a data

10 recording medium, such as a semiconductor media, that can

treat multi-media data, or through a network.

Referring to Fig. 1, the digital content creator includes

a DCT (discrete cosine conversion) section 100, an

electronic watermarked data output section 103 that stores

15 electronic watermarked data, an electronic watermarked data

inserter 102, and a quantization/variable length encoder

104. The DCT is shown as an example of means for spectrum

converting a digital content as a still image or moving

image. Other converters may be used as the DCT.

20 Respective constituent elements are realized by an

information processing device and a memory device, mounted

on a personal computer, on a workstation, or on other

computer system. The information processing device, which

includes an internal memory for storing data, a signal

25 input port, and a signal output port, executes processing

according to a control program. The signal input port may

receive digital contents. The signal output port may a

digital content containing an electronic watermark. The

control program is stored onto a magnetic disk,

5   semiconductor memory, or other recording medium and is

loaded to the information processing device. The recording

medium may be a medium readable by the information

processing device and is not limited by the type thereof.

In response to a digital content issued from a digital

10   content owner (e.g. a copyright owner) via a network or via

a data recording medium, the DCT section 101 subjects it to

discrete cosine conversion and then outputs a frequency

component signals to the electronic watermarked data

inserter 102. The electronic watermarked data output

15   section 103 previously stores as electronic watermarked

data the URL of a Web site supplying advertisement

information. The electronic watermarked data inserter 102

receives a frequency component signal from the DCT section

101 and electronic watermarked data output from the

20   electronic watermarked output section 103 and inserts the

electronic watermarked data into the frequency component

signal. The quantization/variable length encoder 104

subjects the electronic watermarked frequency component

signal to quantification and variable-length encoding and

25   then outputs the encoded signal to the network or to data

recording medium. In other words, using the information

compression technique of MPEG (Motion Picture Experts

Group), the quantization/variable length encoder 104

outputs the MPEG stream to the communication medium,

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5   broadcasting medium, or storage medium.

In this embodiment, the URL itself is inserted as electronic watermarked data. When there is a table for representing the URL with a predetermined index value on the side of the electronic watermarked data extraction

10   device, the index value may be inserted as electronic watermarked data. In this case, the data structure that electronic watermarked data itself may have an index value and the data structure that the bit group of part of electronic watermarked data may have an index value.

15   Next, the operation of the present embodiment will be described by referring to Fig. 2. When the digital content creator is realized by a computer system, the control program that controls the information processing device includes an instruction that makes the information

20   processing device execute respective steps (to be explained below). Thus, the control program makes the information processing device execute the process of inserting electronic watermarked data into the digital content to be input from the signal input port.

25   First, the memory in the electronic watermarked data output section stores as electronic watermarked data the URL of a Web site generating advertisement information (step 201).

Next, after a digital content is input to the signal

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5   input port, the DCT section 101 subjects the input digital

content to discrete cosine conversion (step 202). This step

may be the process of converting the digital content into a

frequency component through the spectrum conversion. The

step does not care about the content.

10   Next, the electronic watermarked data inserter 102

inserts the electronic watermarked data issued from the

electronic watermarked data output 103 into the data

spectrum-converted by the DCT section 101 (step 203).

Thereafter, the quantization/variable length encoder 104

15   quantizes and variable-length encodes the electronic

watermarked frequency component signal output from the

electronic watermarked data inserter 102 and outputs the

electronic watermarked digital content (step 204).

The electronic watermarked digital content thus created

20   is supplied or displayed to users at cost or at no charge

through the data recording medium or though the network (a

communication system or broadcasting system).

This embodiment employs the system of burying electronic

watermarked data into the frequency region after spectrum

25   conversion. However, other system of burying electronic

watermarked data in pixel data may be used as the

electronic watermarked data insertion system. Moreover, the

present embodiment does not care about the types of

contents. However, when the digital content relates to an

5   advertisement image regarding goods or services, how the

     detail information about goods represented with the

     advertisement image is available from the Web site can be

     provided. Moreover, how the goods are available from the

     Web site can be provided. This enables development to the

10   Internet shopping.

     Next, the embodiment of a recording medium according to

     the present invention will be described by referring to Fig.

     3.

     Referring to Fig. 3, the embodiment includes a recording

15   medium 305 that records an electronic watermarked insertion

     program. The recording medium is a magnetic disk, a

     semiconductor memory, or the like. The electronic watermark

     insertion program, which is read in from the recording

     medium 305 to the data processing device 303, controls the

20   operation of the data processing device. Under control of

     the electronic watermark insertion program, the data

     processing device 303 executes the same process as that in

     the previous embodiment. That is, the input device 301

     receives a digital content from the network or from the

25   data recording medium and then outputs it to the data

     processing device 303. The data processing device 303

     inserts electronic watermarked data into the digital

     content and outputs the inserted data to the output device

     304. The output device 304 outputs the digital content

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5   containing the electronic watermarked data to the network

     (in a communication system or broadcasting system) or to

     the data recording medium.

     Next, the digital content reproducer according to the

     embodiment of the present invention will be described by

10   referring to the drawings.

     Fig. 4 is a block diagram illustrating the configuration

     of a digital content reproducer.

     The digital content reproducer extracts electronic

     watermarked data from among a digital content, for example,

15   a still image or moving image, supplied or displayed

     through the data recording medium or though the network (in

     the communication system or broadcasting system), accesses

     the Web site issuing advertisement information based on the

     value of the extracted data, and then manifests the

20   advertisement information on the display.

     Referring to Fig. 4, the digital content reproducer

     includes a decoder 401, an inverse DCT section 402, an

     electronic watermarked data detector 403, a network

     interface 404, a reproducer 405, a display controller 406,

25   and a display 407. The digital content reproducer is

     connected to the Internet. In the digital content

     reproducer, including a WWW Browser installed thereto, is

     set so as to operate it.

     Respective constituent elements are realized on the

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5   information processing device, the memory, and the display,

       mounted on a personal computer, workstation, or other

       computer system. The information processing device, which

       has an internal memory for storing data, a signal input

       port, and a signal output port, executes processing in

10   accordance with the control program. The signal input port

       may receive electronic watermarked digital contents. The

       signal output port may output the URL based on a digital

       content and based on detected electronic watermarked data.

       The control program is stored in a magnetic disk, a

15   semiconductor memory, or other recording medium and then is

       loaded to the information processing device. The recording

       medium may be one that can be read by the information

       processing device and the format thereof is not limited. In

       response to the URL output from the signal output port, the

20   network interface accesses the Web site represented by the

       URL and thus reads out advertisement information. The

       display manifests a digital content and the advertisement

       information thereof.

       In the above configuration, the decoder 401 receives an

25   electronic watermarked digital content (e.g. a content in a

       MPEG stream format) from the network (in a communication

       system or broadcasting system) or from the recording medium

       and then extracts the DCT coefficient. The electronic

       watermarked data detector 403 receives the DCT coefficient

5   from the decoder 401, detects the electronic watermarked

data from the DCT coefficient, and then outputs it to the

network interface 404. Since the electronic watermarked

data contains the URL of the web site, the network

interface 404 accesses the web site shown by the URL, reads

10   out the advertisement information, and then outputs it to

the display controller 406. The web site corresponds to an

advertisement site providing advertisement information. The

inverse DCT section 402 subjects the DCT coefficient sent

from the decoder 401 to inverse discrete cosine conversion

15   and outputs the converted data to the reproducer 405. The

reproducer 405 reproduces the digital content and then

outputs it to display controller 406. The display

controller 406 manifests the advertisement information and

the digital content on the display 407.

20   Fig. 5 shows an example of an image displayed on the

display. Numeral 501 represents the screen displaying a

reproduced digital component. Numeral 502 represents the

screen displaying a home page of an accessed Web site. For

example, when a digital content is an advertisement image

25   regarding goods or services, the advertisement image and

the advertisement information are divisionally displayed on

the display. Thus, the viewer can obtain detailed

information about the goods while seeing the advertisement

image. In order to buy the goods, the viewer can

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5   continuously do the Internet shopping at the web site.

The present embodiment employs the electronic watermark extraction system, paired with the electronic watermark insertion system that buries electronic watermarked data in frequency regions after spectrum conversion. However, the

10 extraction system that is paired with the system of burying electronic watermarked data in pixel data may be used in the present embodiment. That is, the type of electronic watermark extraction system is not the essence of the present invention. The present embodiment does not care

15 about the type of digital content.

Next, the recording medium according to an embodiment of the present invention will be described below by referring to Fig. 6.

Referring to Fig. 6, the embodiment includes a recording

20 medium 606 on which a program having an electronic watermark extraction function and an internet access function is recorded. The recording medium 606 is a magnetic disk, a semiconductor memory, or the like. The electronic watermark insertion program is read in from the

25 recording medium 606 to the data processing device and then controls the operation of the data processing device 603. Under control of the electronic watermarked insertion program, the data processing device 603 implements the same process as that in the previous embodiment. The data

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5   processing device executes the process of reproducing

digital contents.

In other words, the input device 601 receives a digital

content from the network (in a communication system or

broadcasting system) or through the data recording medium

10   and then outputs it to the data processing device 603.

Under control of the program stored in the recording medium

606, the data processing device 603 extracts the electronic

watermarked data from the digital content and then outputs

it to the input/output device 604. The input/output device

15   604 accesses the Web site based on the data and acquires

the advertisement information. The display 605 receives the

digital content and the advertisement information from the

data processing device 603 and the input/output device 604

and then displays them.

20   Next, the advertisement information distribution system

according to an embodiment of the present invention will be

described below by referring to Fig. 7. This system

consists of a digital content creator 702, held by a

service agency 701 which inserts electronic watermarked

25   data into a digital content, a digital content reproducer

706, held by a user 705 which reproduces a digital content,

and a Web site 704, held by an advertisement agency 703

which issues advertisement information onto the Internet.

The digital content creator 702 inserts electronic

5   watermarked data (the URL of the advertisement site 704)

into a digital content such as a still image or a moving

image and then supplies it to users. The digital content is

often provided through a communication network (e.g. the

Internet), a broadcasting network (e.g. satellite

10   broadcasting), or a data recording medium. The specific

configuration has been already described in the previous

embodiments.

The digital content reproducer 706 reproduces an

electronic watermarked digital content and manifests it on

15   the display. Furthermore, the digital content reproducer

706 extracts the electronic watermarked data from the

digital content, accesses the Web site 704 supplying

advertisement information based on the value thereof,

acquires the advertisement information, and then manifests

20   it on the display. The specific configuration has been

described in the previous embodiment.

Next, the whole operation and effect will be explained

below in the example where the digital content is an

advertisement image.

25   The advertisement agency 703 creates a digital content

for an advertisement image. The completed digital content

is provided to a service agency which inserts electronic

watermarked data (A). The electronic watermarked data to be

inserted is the URL of a Web site of the advertisement

5 agency opened over the Internet. Thereafter, the service

   agency 701 supplies the digital content with the electronic

   watermarked data to the user 705 at cost or at no charge

   (B). Using the digital content reproducer 706, the user 705

   reproduces the digital content and views the advertisement

10 image. The digital content reproducer 706 reads out the

   detailed advertisement information from the Web site 704 of

   the advertisement agency and then displays it to the user

   706 (C).

   The above configuration allows the user 705 to see

15 simultaneously both the advertisement image and the

   detailed advertisement information. Thus, the user 705 can

   obtain a detailed knowledge of items regarding the

   advertisement. The advertisement agency 703 can enhance the

   effect of the advertisement and can estimate an increase in

20 advertisement income. This feature allows the service agent

   of inserting the electronic watermarked data to gain

   profits (commission).

   According to the present invention, the business

   providing digital contents into which electronic

25 watermarked data is inserted is technically combined with

   the advertisement business performed over the Internet.

   Thus, this feature enables spreading the electronic

   watermarking technique, activating the advertisement

   business over the Internet, and increasing the

5   advertisement incomes of an advertisement agency having an

     advertisement site.

         The entire disclosure of Japanese Patent Application No.

     2000-258405 filed on August 29, 2000 including

     specification, claims, drawings and summary are

10   incorporated herein by reference in its entirety.